

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

*Lalanirina Gaël Lauricia*¹, *Lahiniriko Abel Solaar*¹, *Andrianjafinoro Tsiriniaina Hasinjanahary*², *Ratsimandresy Naomy Namboarintsoa*¹, *Andrianasolo volahasina valentina*¹, *Razanadraisoa Albertine*¹, *Rabarijaona Sergio Nicko Haritiana*¹, *Ranaivo Joachim Marco*¹, *Ralaiarimanana Liantsoa Fanja Emmanuel*¹.

¹. Department of Dental Prosthetics - Institute of Tropical Odonto-Stomatology of Madagascar – University of Mahajanga – Madagascar

². Department of Conservative Odontology Endodontics - Institute of Tropical Odontology-Stomatology of Madagascar – University of Mahajanga – Madagascar

Corresponding author: Lalanirina Gaël Lauricia

Dentistry Department, PZaGa University Hospital Center, Mahajanga
Department of dental prosthesis, Institute of Tropical OdontoStomatology of Madagascar (IOSTM)

Abstract

A bonded bridge is a fixed prosthesis bonded to the palatal or lingual surface of the abutment teeth. It is one of the current trends in prosthetics. For this reason, we wanted to know where we stood with regard to this issue, which is why we conducted this study, the aim of which was to describe the knowledge and practice of odontostomatologists on this subject.

This cross-sectional descriptive study was conducted from 12 June to 21 July 2023 among odontostomatologists in the city of Antananarivo who were registered with the National Order of Odontostomatologists and who had given their consent to be surveyed. A total of 107 odontostomatologists were included.

Thirty-four point six percent were aware of bonded bridgework and 6.5% of them practiced it. This knowledge was related to their place of training ($p=0.033$)

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges and their practice was strongly related to their knowledge ($p=0.000$), as well as to their specialization ($p=0.022$). The main obstacle to their practice was lack of knowledge (83%). On average, 71.4% followed the steps in the procedure. The most common bonding material used was luting cement (71.4%) and the most common bonded bridge was the 2-winged bridge (85.7%).

This study revealed that bonded bridges were less well known and very little practiced. Additional awareness-raising and training could be considered to promote and encourage them to practice it.

Keywords: knowledge, practice, bonded bridge

Introduction

A bonded bridge is a fixed prosthesis that is bonded to the dental structures, mainly to the previously prepared enamel. It can be used to correct a single or short gap. This bridge represents a better alternative, especially in developing countries where access to implant treatment is still limited for the majority of the population, or in the event of implant failure [1, 2, 3]. According to Lam's 2013 study in China, bonded bridges had a higher success rate of 89.7% compared to implant solutions, which achieved a success rate of 69.2%. In addition, they showed fewer complications, with a percentage of 25.6%, while the implant solution recorded a complication rate of 7.7% after more than 8 years of observation [4]. Originally, this type of prosthesis had two wings, but thanks to improved bonding techniques, the development of new materials, changes in preparation and wing concepts and the partial debonding of the two-wing prosthesis, the bonded bridge is gradually changing and the trend is beginning to move towards the single-wing bonded bridge, also known as the cantilever bonded bridge, which has a much higher success and survival rate than its predecessor [5]. This survival rate was 100% in Germany according to Huttig F and Klink A [6], in Switzerland according to Sailer I and Hämmerle CH [7], in China according to Xu B et al [8], and in Egypt according to Saker S et al [9]. In 2016, the French National Authority for Health (HAS) recommended bonded single-arch bridges for single tooth edentulism [10], and practitioners in

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges developed countries have widely integrated these bridges into their daily practice.

In view of this trend towards bonded bridges, we wanted to find out more about the situation in Madagascar. The aim of this study was to describe the knowledge and practice of bonded bridges in dental practices in the city of Antananarivo.

Methodology

This study was carried out among odontostomatologists in the city of Antananarivo, in private or public practice.

It was a descriptive cross-sectional study that took place over a period of one and a half months, from June 12, 2023 to July 21, 2023.

All odontostomatologists in the city of Antananarivo registered with the Ordre National des Odontostomatologistes (National Order of Odontostomatologists) who gave their consent to be surveyed were included in the study. Excluded were those who did not fill in their form completely (on the last day of our visit) or correctly.

Sampling was exhaustive, and 107 odontostomatologists were selected.

Data were collected using individual self-administered forms. Each form was divided into three distinct parts. The first part contained socio-demographic information such as age, gender, place of training, length of practice, professional status, and specialization in prosthetics. The second part dealt with knowledge of bonded bridges, and the third with the practice of bonded bridges.

Data were then processed and analyzed on a computer using Statistical Package for Social Sciences (SPSS) software, version 20.0 for Windows. Univariate analyses were performed to examine frequency distribution, while bivariate analyses were used to assess relationships between dependent and independent variables. The relationship between variables was verified by the chi-square test, where the significance level was 0.050.

As part of this study, we obtained authorization to conduct surveys from the President of the Ordre National des Odontostomatologistes. The request for

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges authorization to conduct a survey (attached) was issued by the Head of the Odontostomatology Department at the Institut d'Odontostomatologie Tropicale de Madagascar. We have taken every precaution to guarantee the confidentiality of the data collected. We also ensured the anonymity of participants' responses.

The study was limited by the sincerity, cooperation and availability of the odontostomatologists.

Results

Table I: Distribution of odontostomatologists according to socio-demographic profile

Socio-demographic profile	Workforce	Percentage (%)
Gender		
Male	55	51.4
Feminine	52	48.6
Total	107	100
age range		
Less than or equal to 40 years	42	39.2
41 years or older	40	37.4
Not mentioned	25	23.4
Total	107	100
Year of exercise		
Less than 10 years old	32	29.9
Between 11 to 20 years old	36	33.6
More than 20 years	39	36.4
Total	107	100
Activity area		

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Audience	32	29.9
Private	75	70.1
Total	107	100

Table II: Distribution of odontostomatologists according to place of training

Training site	Workforce	Percentage (%)
Madagascar	96	89.7
STRANGER	6	5.6
MADAGASCAR and abroad	5	4.7
Total	107	100

Table III: Distribution of odontostomatologists according to their knowledge and practice of bonded bridge

	Workforce	Percentage (%)
Knowledge of bonded bridge		
Yes	37	34.6
No	70	65.4
Total	107	100.0
bonded bridge practice		
Yes	7	6.5
No	100	93.5
Total	107	100.0

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Table IV: Distribution of odontostomatologists according to their reason for not practicing glued bridge

Patterns	Workforce	Percentage (%)
Lack of concept	83	83
Rumor about its high failure rate	6	6
Fear of premature separation	4	4
Absence of patient to practice it	2	2
Product supply problem	2	2
High cost	1	1
Banned by the workplace	1	1
Incapacity of prosthesis laboratories	1	1
Total	100	100

Table V : Distribution of odontostomatologists according to their practice protocol

Protocols	Numbers (n=7)	Percentage (%)
Pre-prosthetic treatments	6	85.7
Preparation of abutment teeth	6	85.7
Temporary filling	6	85.7
Creation of a temporary prosthesis	4	57.1
Tooth surface conditioning	6	85.7
Conditioning the prosthetic surface	3	42.9
Checking the occlusion	7	100

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Table VI: Distribution of odontostomatologists according to the materials of manufacture and assembly and the number of wings of the bonded bridges produced

Materials	Numbers (n=7)	Percentage (%)
Crafting materials		
Metal-ceramic	03	42.9
Fiber reinforced composite	02	28.6
Ceramic	04	57.1
Zircon	00	0
Assembly materials		
Sealing cement	05	71.4
Composite	03	42.9
Glue	02	28.6
Hybrid materials	01	14.3
Number of fins		
A fin	03	42.9
Two fins	06	85.7
More than two fins	00	00

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Table VII : Distribution of odontostomatologists according to their knowledge and socio-demographic profile

Socio-demographic profile	Knowledge of glued bridge						p
	Yes		No		Total		
	not	%	not	%	not	%	
Gender							0.225
Male	22	40	33	60	55	100	
Feminine	15	28.8	37	71.2	52	100	
Total	37	34.6	70	65.4	107	100	
age range							0.445
Less than or equal to 40 years	16	38.1	26	61.9	42	100	
41 years or older	15	37.5	25	62.5	40	100	
Not mentioned	6	24	19	76	25	100	
Total	37	34.6	70	65.4	107	100	
Year of exercise							0.472
Less than 10 years old	11	34.4	21	65.6	32	100	
Between 11 to 20 years old	15	41.7	21	58.3	36	100	
More than 20 years	11	28.2	28	71.8	39	100	
Total	37	34.6	70	65.4	107	100	
Activity area							0.977
Audience	11	34.4	21	65.6	32	100	
Private	26	34.7	49	65.3	75	100	
Total	37	34.6	70	65.4	107	100	
Training site							0.033
Madagascar	30	31.2	66	68.8	96	100	
STRANGER _	5	83.3	1	16.7	6	100	
Madagascar and abroad	2	40	3	60	5	100	
Total	37	34.6	70	65.4	107	100	
Specialization							0.195
Prosthesis	4	66.7	2	33.3	6	100	
None	32	33.3	64	66.7	96	100	
Others	1	20	4	80	5	100	
Total	37	34.6	70	65.4	107	100	

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Table XIII: Distribution of odontostomatologists according to the practice of glued bridge and their socio-demographic profile

Socio-demographic profile	Bonded bridge practice						p
	Yes		No		Total		
	not	%	not	%	not	%	
Gender							0.753
Male	4	7.3	51	92.7	55	100	
Feminine	3	5.8	49	94.2	52	100	
Total	7	6.5	100	93.5	107	100	
age range							0.451
Less than or equal to 40 years	2	4.8	40	95.2	42	100	
41 years or older	2	5	38	95	40	100	
Not mentioned	3	12	22	88	25	100	
Total	7	6.5	100	93.5	107	100	
Year of exercise							0.091
Less than 10 years old	1	3.1	31	96.9	32	100	
Between 11 to 20 years old	5	13.9	31	86.1	36	100	
More than 20 years	1	2.6	38	97.4	39	100	
Total	7	6.5	100	93.5	107	100	
Activity area							0.936
Audience	2	6.2	30	93.8	32	100	
Private	5	6.7	70	93.3	75	100	
Total	7	6.5	100	93.5	107	100	
Training site							0.504
Madagascar	6	6.2	90	93.8	96	100	
STRANGER_	1	16.7	5	83.3	6	100	
Madagascar and abroad	0	0	5	100	5	100	
Total	7	6.5	100	93.5	107	100	
Specialization							0.022
Prosthesis	2	33.3	4	66.7	6	100	
None	5	5.2	91	94.8	96	100	
Others	0	0	5	100	5	100	
Total	7	6.5	100	93.5	107	100	

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

Discussion

We undertook a descriptive cross-sectional study to describe the knowledge and practice of odontostomatologists in the city of Antananarivo regarding bonded bridges. 107 odontostomatologists were surveyed.

1. Socio-demographic profile of surveyed odontostomatologists (table I)

In the present study, 76.6% of the odontostomatologists surveyed agreed to state their age. This ranged from 25 to 68 years, with an average age of 42. Of these, 39.2% were 40 or under, while 37.4% were 41 or over (Table I). These results are similar to those of the study conducted by Anguis M et al in France in 2021, which also observed a rejuvenation of dental professionals [11].

A slight male predominance ((51.4%) with a sex ratio of 1.06 was observed. The majority of odontostomatologists worked in the private sector (70.1%) and had more than 20 years' experience (36.4%). In contrast to this study, Anguis M et al in France and Randriamalala NC in the Analamanga, Boeny and Atsimo Andrefana regions of Madagascar, in 2021 reported respectively that women were more numerous and the major part or 37.6% had experience of 1 to 10 years [11, 12]. In accordance with Ranivoarilanto E's 2014 study on the status and outlook for oral health in Madagascar, 52.80% of odontostomatologists practiced in the private sector [13].

2. Training site

A minority of odontostomatologists have trained and graduated abroad (5.6%) (Table II). The lack of resources and the relatively high cost of training in developed countries may account for this. This result corroborates those of the study carried out by the Observatoire National de la Démographie des Professions de Santé on the current state of the demography of dental surgeons in France in December 2013, which showed that 4.3% of odontostomatologists in France obtained their diploma abroad [14].

3. Knowledge and practice of bonded bridges

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges

The results in Table III show a low rate of knowledge and practice of bonded bridges among odontostomatologists: 34.6% and 6.5% respectively. These figures differ from those of a study carried out in Côte d'Ivoire by Koua in 2018, where a knowledge rate of 76.1% was observed, although the practice rate was similar [15]. And moreover, knowledge of bonded bridge was significantly related to place of training, with a p-value equal to 0.033 (Table XII); which meant that there was a high probability that odontostomatologists who graduated abroad would have more knowledge of bonded bridge compared to those who underwent initial training in Madagascar. Similarly, there was a significant relationship between the practice of bonded bridgework and specialization in prosthetics, with a p-value equal to 0.022 (Table XIII). This would mean that those who had specialized in prosthetics were more likely to practice bonded bridgework than those who had not. This correlation could be attributed to insufficient theoretical and virtually non-existent practical training during their initial and continuing education [16]. What's more, according to the HAS, the teaching of bonded bridges is faculty-dependent, and their performance by odontostomatology students during their course of study often appeared optional for annual validation [17]. The results of the survey confirmed this observation, as 83% of the odontostomatologists questioned admitted that lack of knowledge on the subject was their main obstacle to the practice of this type of fixed prosthesis (table V).

3.1. Stages in the bonded bridge procedure

As part of the pre-prosthetic treatment, scaling and caries treatment were considered by the majority of odontostomatologists (71.4%). 42.9% of them devitalized the abutment teeth prior to prosthetic treatment, thereby reducing their resistance [18]. According to Boschatel DJ, Vanoverschelde S in 2022, gingival preparation was little practiced by odontostomatologists (14.3%), yet it is of major importance for optimal esthetic integration, particularly in cases of space filling caused by dental agenesis. According to them, this involved creating

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges a gingival contour by ovalizing the edentulous ridge and compressing the gingiva to create a base for the future prosthesis [19].

As for tooth preparation, 14.3% of odontostomatologists did not prepare the abutment teeth. In 2005, Kern described how stabilization, support and retention of the bridge could be ensured by creating a shoulder with a rounded internal angle, two mesial and distal grooves, and a cingular stabilization well [20].

Furthermore, some odontostomatologists (14.3%) had skipped the provisional stage, even though dentine hypersensitivity was common after tooth preparation. However, it is only this stage, which is sometimes neglected, that ensures protection of the dentino-pulpary complex and promotes healing [21].

Before bonding a bridge, the tooth surface must be conditioned to ensure optimum adhesion. This step was carried out by 85.7% of odontostomatologists, while 14.3% did not. According to Bouhai (2021), it is not possible to bond bridge wings to enamel that has not been treated with 30-40% concentrated orthophosphoric acid. This conditioning procedure must be protected from moisture, as the adhesives used are hydrophobic. This is also why adhesion to dentin is not recommended, as it has intrinsic moisture and is therefore less retentive [22]. To ensure the durability of the bonded connection, it was recommended that a specific surface treatment should also be carried out, particularly on the prosthesis winglet. This step was carried out by only 42.9% of odontostomatologists. According to Cazier S and Amar J, simple bonding without adequate surface treatment would not be sufficient to ensure the longevity of the bonded junction. It is therefore necessary to prepare the prosthetic surface appropriately before bonding. Techniques such as sandblasting, silica deposition or the use of a specific bonding agent can be employed to improve adhesion between the prosthesis and surrounding tooth surfaces. This surface treatment optimizes bond retention[23].

Finally, checking the occlusion is also a crucial step in the bridge bonding process, and all the odontostomatologists who practiced this bridge took this step

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges into account. According to Dahan L, it is essential to ensure that there is no occlusal contact at the limit of the bridge's fins. This is necessary to avoid cleavage or shear stresses that could compromise the strength of the bonded connection [24]. Careful checking of the occlusion and adjustment of the occlusal contacts, if necessary, ensures optimum distribution of masticatory forces and increased durability of the bonded bridge [4].

3.2. Type of bonded bridge and materials used for fabrication and assembly

Two-winged bonded bridges were more commonly used by odontostomatologists than single-winged bridges, with a percentage of 85.7% versus 42.9% (Table IV). Despite their higher frequency of use, bonded two-wing bridges may present an increased risk of complications compared to single-wing bridges, since, according to Lucile D, as the number of abutment teeth increases, so does the risk of detachment [24]. In addition, Damien A and Daniel D in 2020 demonstrated that single-wing bonded bridges have a significantly higher success and survival rate than double-winged bridges [5].

The majority of odontostomatologists (71.4%) used luting cement as luting materials, and only 28.6% used adhesives. Cazier S and Amar J pointed out that this was due to the lack of adhesives available on the market [23] and the high cost of the product. This limitation was one of the reasons why some odontostomatologists chose not to perform bonded bridges (Table IV). However, the choice of a suitable bonding material is essential to optimize the adhesion of the bonded bridge [21].

All-ceramic bonded bridges were the most common, accounting for 57.1%. In second place were metal-ceramic bridges with 42.9%, followed by glass-fiber-reinforced bonded bridges with 28.6%. However, no zircon bridges were made. This may be explained by the fact that ceramic is more rigid than metal. As a result, it has less resistance to bending forces, according to Lanoiselee E in 2022

Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges [25]. Numerous studies have also shown that metal-ceramic is frequently used in the manufacture of cemented bridges, in particular cantilever cemented bridges [26,27].

Conclusion

A bonded bridge is a fixed prosthesis that is attached by a bonding system to the palatal or lingual surfaces of healthy abutment teeth. One of the current trends is the two-winged to single-winged bonded bridge, which is a modern option for the management of a single edentulous tooth.

In the city of Antananarivo, bonded bridgework has been less common and still lags behind the evolution of this type of bridge. This was mainly due to a lack of knowledge on the subject. In addition, some odontostomatologists did not follow the correct steps in bridge fabrication, and the bonding material most commonly used was unsuitable for this type of prosthesis, due to the cost and unavailability of glue on the market in Madagascar. This situation jeopardizes the survival of bonded bridges.

At the end of this study, we hope to bring about a change of attitude among odontostomatologists in their general practice and with regard to the management of small edentulous restorations.

References

1. Benfaida S, Andoh A. Bonded bridge with handle. *AOS*. 2017;286(5): 1-6.
2. Kouam KA, Pesson DM, Didia E, Tra BZR, Baku OD, Binaté A, et al. Obstacles to the practice of bonded bridge in Côte d'Ivoire. *Rev Col Odontol AfrChirMaxillo-fac*. 2018;(Special):95-9.
3. Boudas R. Cantilever ceramic bonded bridge on veneer. *Dentoscope*;(219):52-6.
4. Lam WY, Botelho MG, McGrath CP. Longevity of implant crowns and 2-unit cantilevered resin-bonded bridges. *Clin Oral Implants Res*. 2013;24(12):1369-74.
5. Alegre D, Dot D. _ All-ceramic Cantilever bonded bridge: precautions, protocol, survival rate and illustration by two clinical cases. *Clinic*. 2020;3.

- Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges
6. *Huttig F, Klink A. Zirconia-based anterior resin-bonded single-retainer cantilever fixed dental prostheses: a 15- to 61-month follow-up. Int J Prosthodont. 2016;29(3):284-6.*
 7. *Sailer I, Hämmerle CH. Zirconia ceramic single-retainer resin-bonded fixed dental prostheses (RBFDPs) after 4 years of clinical service: a retrospective clinical and volumetric study. Int J Periodontics Restorative Dent. 2014;34(3):333-43.*
 8. *Xu B et al. Single-Tooth Replacement in the Anterior Arch by Means of a Cantilevered IPS e.max Press Veneer-Retained Fixed Partial Denture: Case Series of 35 Patients. Int J Prosthodont. 2013;26(2):181-7.*
 9. *Saker S et al [Saker S et al. Clinical survival of anterior metal-ceramic and all-ceramic cantilever resin-bonded fixed dental prostheses over a period of 60 months. Int J Prosthodontics. 2014;27(5):422-4.*
 10. *Assessment of cantilever (cantilever bridges) and cement-retained multi-unit prostheses. (bonded bridges). HAS. 2016:8-12.*
 11. *Anguis M, Bergeat M, Pisarik J, Vergier N, Chaput H. What recent and future demographics for the medical and pharmaceutical professions? Demographic findings and projections. DREES files. 2021;76:4-11.*
 12. *Randriamalala NC, Andrianjafinoro TH, Rakotonirina FP, Ramaroson J. Therapeutic success of iatrogenic perforation in endodontics in the Analamanga, Boeny, Atsimo Andrefana region (Madagascar). IJPSAT. 2022;34:07-14.*
 13. *Ranivoarilanto E. Oral health in Madagascar: current situation and perspectives. 2014.*
 14. *Demographic situation of dental surgeons. ONDPS. 2013.*
 15. *Koua YV. Bonded bridges: knowledge, attitudes and practices of dental surgeons in the city of Abidjan [Chir Dent thesis]. Abidjan-Ivory Coast: UFROS. 2018:152.*
 16. *Kouam KA, Pesson DM, Didia E, Tra BZR, Baku OD, Binaté A, et al. Obstacles to the practice of bonded bridge in Côte d'Ivoire. Rev Col Odontostomatol Afr Chir Maxillo-fac. 2018;(Special):95-9.*
-

- Knowledge and practices of odontostomatologists in the city of Antananarivo on bonded bridges
17. *Evaluation of cantilever bridges and partially coronal-anchored fixed multi-unit prostheses HAS. 2015:14.*
 18. Viennot S , Malquarti G, Allard Y. *Tissue economy and aesthetics. Prosthesis notebooks. 2003;(124). Available at: <https://www.editionsmdp.fr/revues/les-cahiers-de-prothese/article/n-124/economie-tissulaire-et-esthetique.html>*
 19. Boschattel DJ , Vanoverschelde S. *Cantilever bridge contribution of plastic surgery for an aesthetic result. The dental wire. 2022. Available at: <https://www.lefildentaire.com/articles/bridge-cantilever-apport-de-la-chirurgie-plastique-pour-un-resultat-esthetique/>*
 20. Kern M. *Clinical long-term survival of two-retainer all ceramic resin-bonded fixed partial dentures. Quintessence Int. 2005;36(2):141-7.*
 21. Durand SH, Farges JC, Pirel C, Jemai S, Millet C. *Prosthetic restoration on living teeth, preserving the pulp. Inf. Tooth. 2009; 91(9):411-9.*
 22. Bouhai. *Bonded bridges. Facmeduniv Constantine 3. 2021.*
 23. Cazier S , Amar J. *Metal bonding procedures: example of the assembly of a cast noble alloy splint. Alternative;(27):13-22.*
 24. Dahan L. *Update on bonded bridges: The 10 key points in bonding: 60-5. Available on file:///E:/pr%C3%A9paration%20cl%C3%A9n%C3%A9e%20de%20SOMAPROD/Nouveau%20dossier/article_20Dahan.pdf*
 25. Lanoiselee E. *Arguments in the sense of nuance. Dental floss. 2022.*
 26. Botelho MG, Chan AW, Leung NC, Lam WY. *Long term evaluation of cantilevered vs fixed-fixed resin bonded fixed partial dentures for missing maxillary incisors. J Dent. 2016;45:59-66.*
 27. Lalanirina GL, Andrianjafinoro TH, Andrianinarivo RG, Razanadraisoa A, Rabarijaona HSN, Ratsimandresy NN et al. *Therapeutic treatment of an anterior edentulous unit: a case of a cantilever bonded bridge. Malagasy online odontostomatology journal ISSN 2220-069X2022;23:20-28.*
-